



U.S. Department of Energy
Office of River Protection

P.O. Box 450
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03-OSR-0040

Mr. R. F. Naventi, Project Manager
Bechtel National, Inc.
2435 Stevens Center
Richland, Washington 99352

Dear Mr. Naventi:

CONTRACT NO. DE-AC-01RV14136 – INSPECTION REPORT A-03-OSR-RPPWTP-006 –
ON-LOCATION INSPECTION REPORT FOR THE PERIOD DECEMBER 5, 2002, THROUGH
JANUARY 24, 2003

This letter forwards the results of the U.S. Department of Energy, Office of River Protection (ORP) review of Bechtel National, Inc. (BNI) construction performance on the Waste Treatment and Immobilization Plant for the period December 5, 2002, through January 24, 2003. Although there are no Findings, the inspection identified one significant concern regarding BNI's compliance with National Electric Code (NEC) requirements. Details of the inspection are documented in the enclosed inspection report.

During this inspection and the last construction inspection (see Inspection Report A-03-OSR-RPPWTP-001), ORP identified approximately 30 examples of noncompliance with NEC requirements. These have, so far, been contained to temporary electrical installations or, in a few cases, balance-of-plant applications and, when identified, have been corrected by BNI. Nevertheless, the examples represent potential electrical safety issues to personnel that warrant immediate senior management attention. During the exit meeting, BNI stated it was in the final stages of hiring an experienced NEC inspector to supplement BNI field engineering inspection efforts. We encourage this initiative and request development of a systematic process to ensure compliance with NEC requirements and to ensure past site electrical work will be reviewed for compliance with NEC requirements.

If you have any questions, please contact me, or your staff may call Robert C. Barr, WTP Safety Regulation Division, (509) 376-7851.

Sincerely,

Roy J. Schepens
Manager

OSR:JWM

Enclosure

cc w/encl:
W. R. Spezialetti, BNI

U.S. DEPARTMENT OF ENERGY
Office of River Protection

INSPECTION: On-location Inspection Report for the Period December 5, 2002, through
January 24, 2003

REPORT NO: A-03-OSR-RPPWTP-006

FACILITY: Bechtel National, Inc.

LOCATION: 2435 Stevens Center
Richland, Washington 99352

DATES: December 5, 2002, through January 24, 2003

INSPECTORS: J. McCormick-Barger, Sr. Regulatory Technical Advisor, Inspection Lead
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EXECUTIVE SUMMARY
On-location Inspection Report for the Period
December 5, 2002, Through January 24, 2003
Inspection Report Number A-03-OSR-RPPWTP-006

Introduction

This inspection of Bechtel National, Inc. (the Contractor) construction activities covered the following areas:

- Adequacy of Fire Protection Piping System Work Activities (Section 1.2)
- Adequacy of Forms, Reinforcement Steel, and Embedded Steel Items and Associated Concrete Placements (Section 1.3)
- Adequacy of Low Activity Waste (LAW) Cold Joint Recovery Actions (Section 1.4)
- Industrial Health and Safety (IH&S) Oversight (Section 1.5)
- Observation of a Construction Emergency Preparedness Drill (Section 1.6)
- Adequacy of Balance-of-Plant Construction Activities (Section 1.7)
- Review of Inspection Follow-up Items (Section 1.8).

Significant Observations and Conclusions

- The Contractor had accomplished hydrostatic testing, cleaning, and flushing of fire service water piping systems in accordance with established requirements. (Section 1.2)
- With one exception, the Contractor had accomplished installation of reinforcement steel and placement of concrete in accordance with approved specifications, procedures, and authorization basis requirements. A non-cited Finding was identified for painting some Pretreatment Facility north pit rebar prior to concrete placement; a violation of Safety Requirement Document, Safety Criterion 4.1-2. (Section 1.3)
- Installation of the dowels that will be used in the LAW cold joint was performed in accordance with the specified requirements. (Section 1.4)
- The Contractor had acceptably implemented its program for industrial health and safety, with a few minor exceptions that were promptly corrected during the inspection period. (Section 1.5)
- Continuing activities to upgrade the Potain Tower Cranes to comply with electrical and safety code requirements were performed acceptably. (Section 1.5)

- The Contractor successfully conducted an emergency preparedness drill. The emergency response organization performed the necessary actions to care for a simulated injured worker in a timely and satisfactory manner and a critical post-drill critique was completed. (Section 1.6)
- A number of electrical code noncompliances were identified during inspections of LAW, High Level Waste, high mast lighting, warehouse, and fuel dispensing station construction activities. While the Contractor corrected some of these noncompliances during the inspection period, many remained unresolved and will be reviewed later. Resolution of these noncompliances is being tracked as Assessment Follow-up Items. The number of noncompliances (about 30 National Electric Code noncompliances) indicate a significant weakness in the Contractor's program for ensuring National Electric Code compliance during construction. (Section 1.7)
- Two previously identified Findings and one inspection follow-up item were closed during this inspection period. (Section 1.8)

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ON-LOCATION INSPECTION REPORT FOR PERIOD OF DECEMBER 5, 2002, THROUGH JANUARY 24, 2003

1.0 REPORT DETAILS

1.1 Introduction

This inspection assessed the Contractor's performance of important-to-safety (ITS) recovery activities associated with the Low Activity Waste (LAW) basemat concrete cold joint; installation of forms, reinforcing steel, and embedments; and concrete placements for conformance with regulatory requirements specified in the Quality Assurance Manual (QAM), Safety Requirements Document (SRD), design documents, approved work procedures, and committed codes and standards. The inspection also reviewed the Contractor's implementation of firewater piping system construction activities, a construction emergency preparedness drill, and aspects of its Industrial Health and Safety program, including observing Contractor and subcontractor worker safety practices.

In addition, this inspection assessed the Contractor's performance of Balance-of-Plant (BOP) work activities not classified as ITS. Specifically, the inspectors examined several installations of temporary power for conformance with established industry standards and design requirements.

Details and conclusions regarding this inspection are described below.

1.2 Adequacy of Fire Protection Piping System Work Activities (Inspection Technical Procedure [ITP] I-138)

1.2.1 Inspection Scope

The SRD, Volume II, Section 4.5, *Fire Protection*, safety criterion required the Contractor to conform with National Fire Protection Association (NFPA) 801, *Standard for Facilities Handling Radioactive Materials*, 1995 Edition. NFPA 801 required conformance with several other NFPA standards, including the 1192 addition of the NFPA-24, *Standard for the Installation of Private Fire Service Mains and their Appurtenances*.

The inspectors examined seven hydrostatic test packages for conformance with SRD Safety Criteria specified in Volume II, Section 4.5 requirements and observed the conduct of hydrostatic testing on five fire protection piping segments, and two piping system flushes to determine whether the testing conformed to the requirements.

1.2.2 Observations and Assessments

In preparation for inspecting firewater testing activities, the inspectors examined the following documents governing the installation, flushing and cleaning, and hydrostatic testing of the Fire Service Water System:

- 24590-BOF-C2-C12T-00013, *Firewater, Potable Water, Plant Service Air Yard Utility Composite Plan – Area 13*, Revision 3, dated September 9, 2002.
- 24590-BOF-C2-C12T-00014, *Firewater, Potable Water, Plant Service Air Yard Utility Composite Plan – Area 14*, Revision 2, dated September 9, 2002.
- 24590-BOF-C2-C12T-00015, *Firewater, Potable Water, Plant Service Air Yard Utility Composite Plan- Area 15*, Revision 2, dated September 9, 2002.
- 24590-BOF-C2-C12T-00016, *Firewater, Potable Water, Plant Service Air Yard Utility Composite Plan- Area 16*, Revision 2, dated August 29, 2002.
- 24590-BOF-C2-C12T-00017, *Firewater, Potable Water, Plant Service Air Yard Utility Composite Plan - Area 17*, Revision 3, dated August 29, 2002.
- 24590-BOF-C2-C12T-00018, *Firewater, Potable Water, Plant Service Air Yard Utility Composite Plan – 18*, Revision 2, dated September 10, 2002.
- 24590-BOF-C2-C12T-00019, *Firewater, Potable Water, Plant Service Air Yard Utility Composite Plan – 19*, Revision 2, dated September 10, 2002.
- 24590-BOF-C2-C12T-00020, *Firewater, Potable Water, Plant Service Air Yard Utility Composite Plan- Area 20*, Revision 2, dated August 29, 2002.
- 24590-BOF-C2-C12T-00022, *Firewater, Potable Water, Plant Service Air Yard Utility Composite Plan- Area 22*, Revision 2, dated September 9, 2002.
- 24590-BOF-C2-C12T-00023, *Firewater, Potable Water, Plant Service Air Yard Utility Composite Plan – Area 23*, Revision 3, dated September 9, 2002.
- 24590-BOF-C2-C12T-00024, *Firewater, Potable Water, Plant Service Air Yard Utility Composite Plan- Area 24*, Revision 2, dated August 29, 2002.
- 24590-BOF-C2-C12T-00025, *Firewater, Potable Water, Plant Service Air Yard Utility Composite Plan – Area 25*, Revision 2, dated September 9, 2002.
- 24590-BOF-C2-C12T-00026, *Firewater, Potable Water, Plant Service Air Yard Utility Composite Plan – Area 26*, Revision 2, dated September 9, 2002.
- 24590-BOF-C2-C12T-00027, *Firewater, Potable Water, Plant Service Air Yard Utility Composite Plan – Area 27*, Revision 3, dated September 9, 2002.
- 24590-BOF-C2-C12T-00029, *Firewater, Potable Water, Plant Service Air Yard Utility Composite Plan – Area 29*, Revision 2, dated September 9, 2002.

- 24590-BOF-C2-C12T-00030, *Firewater, Potable Water, Plant Service Air Yard Utility Composite Plan – Area 30*, Revision 2, dated September 10, 2002.
- 24590-BOF-C2-C12T-00031, *Firewater, Potable Water, Plant Service Air Yard Utility Composite Plan – Area 31*, Revision 3, dated September 10, 2002.
- 24590-BOF-3PS-PZ41-T0001, *Engineering Specification For Underground Fire Protection Piping Mains*, Rev. 3, dated October 14, 2002.

The inspectors examined the Contractor's test packages 24590-WTP-PTR-P-02-0084, Revision 0, BOF Area 22, 26, and 30; 24590-WTP-PTR-P-02-0086, Revision 0; 24590-WTP-PTR-P-02-0091, Revision 0, and 24590-WTP-PTR-P-02-0093, Revision 0, BOF Area 13, 14, 15, 17, 18, 19, 23, 24, 27 and 31; 24590-WTP-PTR-P-03-0008, Revision 0, BOF Area 25, 29; 24590-WTP-PTR-P-03-0009, Revision 0, BOF Area 19; and 24590-WTP-PTR-P-03-0011, Revision 0, BOF Areas 26, and 27. The inspectors verified the proper test boundaries were specified, valve line-ups were thorough, and the required test parameters had been specified. The inspectors verified the calibration of the pressure gauge was current, the appropriate calibration stickers were affixed, and the gauge range conformed to the requirements established by National Fire Protection Association (NFPA), *Standard for the Installation of Private Fire Service Mains and their Appurtenance*.

The inspectors examined the Contractor's Flushing and Cleaning package 24590-WTP-FTR-P-02-013, Revision 0, BOF Area 17, 18, and 22, and 24590-WTP-FTR-P-02-024, Revision 0, BOF Area 20, 24, and 31, and verified the flush boundaries were specified and the valve line-ups were thorough. The inspectors observed the flush of the systems as described in above referenced packages, and observed the flow rate was the maximum flow rate available to the system under fire conditions as described in Section 6.2, *Engineering Specification For Underground Fire Protection Piping Mains*. Flow rate was achieved by the use of 2 onsite fire pumps. Flush water was observed to be clean and free of foreign material. The inspectors concluded the flushing and cleaning of the referenced systems were performed in accordance with the Contractor's specifications and referenced codes.

The inspectors observed the conduct of hydrostatic testing on a portion of the fire service water piping in Area 15, 16, 20, 22, and 24, and verified the hydrostatic testing had been conducted in accordance with the Contractor's established requirements and NFPA 24, and the system tests conformed to established requirements regarding leakage and time at pressure.

1.2.3 Conclusions

The inspectors concluded the Contractor had accomplished hydrostatic testing, cleaning, and flushing of fire service water piping systems in accordance with established requirements.

1.3 Adequacy of Forms, Reinforcement Steel, and Embedded Steel Items and Associated Concrete Placements (ITP I-113)

1.3.1 Inspection Scope

The inspectors examined the Contractor's and subcontractor's procedures and engineering technical specifications governing the installation of reinforcement steel, embedment plates, and structural concrete, to determine whether the specified activities conformed to authorization basis (AB) and industry codes and standards requirements, specified in the SRD, Volume II, Safety Criterion 4.1-2. Further, the inspectors examined the installation of reinforcing steel and concrete placement activities in the field to assess whether those activities had been conducted in accordance with Contractor and subcontractor program, procedure, and AB requirements.

1.3.2 Observations and Assessments

The inspectors examined the following documents governing the installation and inspection of ITS structural concrete:

- 24590-WTP-3PS-D000-T0001, *Engineering Specification For Concrete Work*, Revision 2, dated July 31, 2002.
- 24590-WTP-3PS-DB01-T0001, *Engineering Specification For Furnishing and Delivering Ready-Mixed Concrete*, Revision 4, dated September 4, 2002.
- 24590-BOF-3PS-C000-T0001, *Engineering Specification For Material Testing Services*, Revision 2, dated July 12, 2002.
- 24590-WTP-3PS-FA01-T0001, *Engineering Specification For Furnishing of Anchor Bolts (Rods)*, Revision 1, dated February 5, 2002.
- 24590-WTP-GPP-CON-3203, *Concrete Operations (Including Supply)*, Revision 3, dated January 13, 2003.

A previous review of the *Concrete Operations (Including Supply)* procedure was documented in IR-02-014. However, the procedure had been revised to Revision 3 since the previous review. The inspectors concluded the revised procedure and the other documents described above continued to conform to the Codes and Standards required by SRD Safety Criterion 4.1.2, and contained the necessary installation requirements to perform the work.

In preparation for a walk-down of recently installed reinforcement steel and other components incorporated within the placement, the inspectors examined several drawings in the areas of concrete reinforcement, forming, and arrangement, and examined construction work activities on the Pretreatment Facility (PTF), High Level Waste (HLW), and LAW buildings for conformance with the requirements of the applicable drawings. (See Section 1.4, below, for additional discussions regarding Contractor preparations for placing concrete at the LAW cold joint.) The inspectors compared the drawings to a Document Report obtained from Project Document

Control (PDC), which contained a revision status received prior to the walk-down. From this comparison, the inspectors concluded the drawings were the most current revisions at the time of the walk-down. The inspectors examined the Contractor's Concrete Pour Cards for compliance to the engineering specifications and procedures for the above buildings.

- Concrete Pour Card – HLW-0008
- Concrete Pour Card – PTF-C-0002
- Concrete Pour Card – PTF-C-0005
- Concrete Pour Card – PTF-C-0010-1
- Concrete Pour Card – LAW-0001B
- Concrete Pour Card – LAW-0001C
- Concrete Pour Card – LAW-0001D
- Concrete Pour Card – LAW-0010.

The inspectors examined the Concrete Pour Cards for the placements discussed above, and concluded the required signatures were in place prior to the start of the placements.

The inspectors witnessed the concrete placement to repair the cold joint in the LAW building basemat; placement numbers LAW-0001B, C, and D. The concrete temperatures prior to placement were in accordance with engineering specifications and codes. The inspector identified two missing No. 11 reinforcing steel splice bars to field engineering and the Contractor took immediate corrective action to correct the situation. A portion of this placement involved placing concrete under two large carousal embedments (12 foot octagons). The carousal embedments were manufactured with holes for the concrete pump truck nozzle and the concrete vibrators. This preplanning by the Contractor resulted in full depth, well consolidated, concrete under the embedments. The concrete was placed, consolidated, and tested in accordance with applicable engineering specifications, concrete operations procedures, and industry codes.

The inspectors observed field engineer (FE) staff performing concrete receipt activities and observed their review of the batch tickets as required by Section 3.11.2 of the *Concrete Operations (Including Supply)* procedure, furthermore, the inspectors observed the FE directing the Material Testing subcontractor to perform additional testing of the delivered concrete to ensure the requirements of the specification were being met. The inspectors concluded these activities were performed in accordance with the requirements.

The inspectors observed the Materials Testing subcontractor field technicians performing concrete receipt activities and observed the review of batch tickets and recording of information required by section 3.2.1 of the *Engineering Specification for Material Testing Services*. The inspectors concluded these activities were performed in accordance with the specification.

The inspectors examined the conduct of testing for concrete temperature, slump, unit weight, filling and capping the 6-inch by 12-inch compressive test cylinders, and the field storage of the test cylinders for the placements identified above. The inspectors concluded the Material Testing subcontractor technicians were performing these testing activities in accordance with their procedures, the applicable ASTM standards, and Contractor's specifications.

The inspectors witnessed the above concrete placements in the LAW, HLW, and PTF buildings. The inspectors concluded the concrete was being produced, placed, consolidated, and tested in accordance with procedures, specifications, and required codes and standards. During inspections of the placements, the inspectors concluded the Contractor was conforming to the maximum 24-inch lift height, as required by Section 3.7.4 of *Engineering Specification for Concrete Work*. The inspectors observed the 4-foot per hour maximum placement rate, established by the panel manufacturer, was being maintained. This process was being performed by use of a cut-away tremie system, which insured the concrete was being placed in a controlled manner within the wall. The process also ensured the concrete did not exceed the maximum free fall distance, as outlined in Section 3.7.1 of *Engineering Specification for Concrete Work*.

The inspectors observed during placement PTF-C-0010-1, some reinforcement steel was painted with spray paint to signify to the laborers this was a congested area for consolidation of the concrete. There were approximately 16 reinforcement bars painted half way around the bar for approximately 24 inches in length. The inspectors notified the Contractor of this situation. The Contractor acknowledged this was a violation of the above concrete specification and issued non-conformance report (NCR) 24590-WTP-NCR-CON-03-009. The NCR was dispositioned "use-as-is" based on an engineering evaluation concluding the rebar design in the affected zones could accommodate the painted bars being rendered ineffective and still be within design capacity. The Contractor informed the inspectors the concrete crews were instructed painting ITS rebar was prohibited. SRD, Safety Criterion (SC) 4.1-2 specifies as an implementing code and standard American Concrete Institute (ACI) 349-01, *Code Requirements for Nuclear Safety Related Concrete Structures*. ACI 349-01, Section 7.4, *Surface conditions of reinforcement*, states: "At the time concrete is placed, reinforcement shall be free from mud, oil, or other nonmetallic coatings that decrease bond." Failure to ensure reinforcement steel met this ACI requirement would normally be cited as a Finding, however, this issue met the non-cited Finding criteria in Inspection Administrative Procedure A-104, "Inspection Performance." The observed condition was of minor safety significance, entered in their corrective action program, and promptly dispositioned. Therefore, this condition was identified as a non-cited Finding.

During the HLW basemat concrete placement (Area 5A) on January 7, 2003, a Washington State Department of Ecology inspector questioned the time a GN Northern technician took to raise the mold for a concrete slump test. The measured slump was 5 inches; within the specified slump requirement of 4 ± 1 inch. However, the Ecology inspector counted the mold removal at 10 seconds. American Society of Testing and Materials (ASTM) C 143 specifies the mold to be raised in 5 ± 2 seconds. The Ecology inspector felt if the mold were removed in the specified time, the slump would have been out of specification. The Ecology inspector did not notify the Contractor of his observation. Instead the Ecology inspector notified DOE inspectors approximately one hour later. The DOE inspectors witnessed several slump tests before and after being notified by the Ecology inspector of his observation. All tests observed were performed in accordance with the ASTM requirements. The DOE inspector notified the Field Quality Control Manager of the Ecology inspector observation. The Field Quality Control Manager sent a message to all Field Quality Control Engineers reconfirming the ASTM requirements. At the lesson-learned meeting on January 8, 2003, the slump test was discussed. The HLW Civil Quality Control Engineer stated he counted 7 seconds for the mold removal. When questioned how he was sure it was the same slump test the Ecology inspector had observed, he stated it was the only test for the entire placement that was on the high range of the

slump requirement. The Contractor stated if anyone questioned the slump test, another test would be performed immediately. During the next concrete placement, the GN Northern technicians counted verbally while removing the mold. The Ecology inspector considered the item closed.

1.3.3 Conclusions

With one noted exception, the inspectors concluded the concrete for the PTF, HLW, and LAW building basemats and walls was being produced, placed, consolidated, and tested in accordance with procedures, specifications, and required codes and standards. A non-cited Finding was identified for painting some Pretreatment Facility north pit rebar prior to concrete placement; a violation of Safety Requirement Document, Safety Criterion 4.1-2.

1.4 Adequacy of LAW Cold Joint Recovery Actions (ITP I-113)

1.4.1 Inspection Scope

On July 11, 2002, the Contractor prematurely terminated concrete placement LAW-0001 due to the concrete batch plants' inability to supply concrete at less than or equal to 70°F during a day when the ambient temperature reached about 110°F. This action resulted in an unplanned concrete cold joint. The Contractor issued an NCR and performed a root cause analyses of the event and began taking actions to recover from the event. The original LAW-0001 placement was documented in inspection report IR-02-008, Section 1.8. This inspection examined the Contractor's program and procedures for installing shear dowels in the cold joint.

1.4.2 Observations and Assessments

The LAW foundation basemat cold joint formed an unfinished concrete surface that resulted from an interruption of the concrete placement. The initial design thickness of the basemat was established to preclude the installation of shear reinforcement. The design was based on the unreinforced shear capacity of the concrete. The Contractor planned to restore the design shear resistance capacity at the cold joint by both concrete bond and shear friction of newly installed reinforcing steel dowels. The Contractor determined the grouting of reinforcing steel dowels into the existing concrete cold joint surface would tie the placements together across the interface. In order to ensure performance of the reinforcing steel dowels, the Contractor conducted qualification testing of the dowels on a test slab constructed to test reinforcing steel dowel pull out capacity. The ORP examination of this testing was documented in inspection report A-03-OSR-RPPWTP-001, Section 1.4. This inspection focused on the installation of the dowels in the cold joint.

The inspectors examined the following documents governing the installation of dowels in the cold joint:

- 24590-LAW-SI-C-02-010, *Special Instructions for Installing Dowels in the Cold Joint Area of LAW Basemat*, dated November 27, 2002, Sheet 5 of 6 revised January 9, 2003.
- The Course Completion Record for 24590-LAW-SI-C-02-010, *Special Instructions for Installing Dowels in the Cold Joint Area of LAW Basemat*, dated November 27, 2002, Sheet 5 of 6 revised January 9, 2003.
- The completed Cold Joint Dowel Preparation Sheets.
- GN Northern, Inc. Concrete Test Reports for the grout cubes.
- BNI Memorandum (CCN 050135) dated January 16, 2003, regarding two dowels installed with 24-hour cure.

The inspectors observed dowel holes were drilled 1 5/8 inch in diameter, spaced at 12 inches maximum, starting no more than 12 inches from the edge of the foundation surface, at 12 inch minimum depths, and protected from accumulation of water during freezing temperatures. The holes were pre-soaked for 24 hours before dowel installation, protected from contamination, and vacuumed prior to grout installation. The grout was mixed in accordance with Master Builders' recommendations summarized in the Special Instructions. The inspectors conducted random observations of the grout mixing and placement. Contractor Quality Control and Quality Assurance personnel were actively measuring each dowel hole and embedment length, and witnessing the dowel placements. A wood framed plastic enclosure was built over the cold joint area to maintain temperatures for doweling operations. The inspectors concluded dowel installations were being performed in accordance with the specified requirements and Special Instructions, and in accordance with general good construction practice for anchor doweling.

1.4.3 Conclusions

The inspectors concluded the Contractor had ensured installation of the dowels in the cold joint was performed in accordance with the specified requirements, Special Instructions, and the grout manufacturer's instructions. In addition, the inspectors concluded the Contractor had inspected and approved each installed dowel.

1.5 Industrial Health and Safety (IH&S) Oversight (ITP I-161)

1.5.1 Inspection Scope

The inspections in this area focused on the implementation of the Contract industrial health and safety requirements described in ORP M 440.1-2, Industrial Hygiene and Safety Regulatory Plan for the Waste Treatment Plant Contractor. Specifically, the inspectors assessed compliance to the requirements of the Contractor's Non-Radiological Worker Safety and Health Plan, PL-W375-IS00001, Revision 1, dated March 12, 2001, for the River Protection Project –Waste Treatment Plant, which had been reviewed and approved by the Office of Safety Regulation (OSR), along with applicable requirements specified in ORP M 440.1.2. Areas reviewed

included hazard review performance by the safety engineers, job hazard analysis, hoisting and rigging, temporary enclosures, and other balance-of-plant areas, such as propane tank storage and utilization.

1.5.2 Observations and Assessments

Design and Plan Review for New Equipment and Facilities

The inspectors determined, through discussion with the Contractor's safety engineer, an early proactive review of the plan layout of Chicago Bridge and Iron's pressure vessel fabrication facility resulted in some timely changes which had increased safety as well as reduced project costs by early detection and correction.

However, the discussions with the Contractor revealed safety engineers had not reviewed the facility utilization layout for the "combo shop". For example, issues and engineering controls related to grinding, polishing, welding, and testing, or the placement of unique equipment had not been examined. The inspectors discussed the breadth and scope of pre-construction hazards review, performed prior to the construction and siting of the various crafts and equipment within the shop, with responsible Contractor representatives. The inspectors learned the Combo shop facility was a template design, which had been used by the Contractor on various large construction sites for twenty years. Safety representatives had not reviewed either the shop drawings or the environmental controls associated with the activities of multiple crafts within the same building. For example, the Contractor planned to provide up to 20 production welders within the shop. However, the existing shop was only equipped with ceiling mounted Heating, Ventilation, and Air Conditioning (HVAC) systems with no existing local exhaust configurations. The Contractor planned to perform industrial hygiene sampling and ventilation surveys after the shop was occupied and then, based upon results of findings, provide necessary modifications. The Contractor planned to analyze the existing air handling systems and flow to determine if they could provide a safe work environment for such activities as welding.

The inspectors determined, through extensive discussions with the Contractor, a thorough industrial hygiene and safety hazards review had not been accomplished for the use of this facility. The Contractor considered the shop a temporary construction support facility. The inspectors disagreed and considered the projected five continuous years of work in the shop as more representative of a permanent facility; and, accordingly, more deserving of a thorough IH&S hazards review. The welding area ventilation issue was an example of a hazard element deserving of a thorough, proactive safety review. Other issues, such as noise or machine guarding were attributes deserving hazard review based upon the requirements within ORP M440.1-2.

The Contractor stated, for the Combo shop, a professional evaluation of the ventilation system would be conducted by their engineers to determine whether any near term modifications were necessary. The Contractor also initiated actions to assess conformance with other industrial hygiene requirements for this facility and provide any necessary modifications. Follow-up of this review will be tracked as assessment follow-up item (AFI) A-03-OSR-RPPWTP-006-A01.

The inspectors reviewed the adequacy of the Contractor's industrial hygiene and safety reviews of two groups of essential equipment. The inspectors reviewed the Field Material Requisitions (FMR) for the tower cranes, which had already been received and erected, and the pedestal cranes, which were being procured for installation on the Pre-treatment, HLW, and LAW facilities. The inspectors reviewed the procurement documentation to determine whether the procurements contained unique equipment or processes deserving of special IH&S consideration.

In the case of the tower cranes, the inspectors determined special conditions within the Contract specified all applicable OSHA requirements be followed and the National Electric Code (NEC) requirements for cranes and hoists be implemented. The NEC required all wiring and fixtures, referenced in the body of the requirement, be "listed" or be approved by a nationally recognized laboratory. The FMR requirements were adequate. However, the purchase requisition did not require the equipment be inspected upon receipt to ensure those special requirements were implemented. Further, the Contractor did not inspect the equipment received to ensure the special conditions had been implemented. Failure to ensure the provisions of the FMR were implemented resulted in significant deficiencies regarding failure to conform to NEC and OSHA requirements, as discussed in Section 1.5.2 of Inspection Report A-03-OSR-RPPWTP-001.¹

To determine whether a similar problem might exist with the pedestal cranes, procurement documents were reviewed by the inspectors and found to include appropriate safety criteria. The criteria were more specific than those included for the tower cranes. The schematic drawing from the vendor identified a ladder-way, which did not conform to the cited special requirements within the procurement documents. This non-conformance was brought to the attention of the Contractor. The Contractor stated they would require the vendor to implement a ladder design that conformed to the procurement document.

Job Hazards Analysis

The inspectors examined the quality and scope of the Site Job Hazards Analysis (JHA) program. Over the last 12 months, the inspectors have reviewed and acknowledged by signature almost every JHA at every work site. The inspectors determined the JHA process conformed to the requirements of the Contractor's procedures and possessed the appropriate scope and detail to properly inform the workers of the credible hazards on the job sites.

Hoisting and Rigging

The inspectors examined, with the Contractor's technical, management, and vendor representatives, plans for the assembly and erection of the Link-Belt Model 248 crane in luffing configuration. The Contractor provided a "punch-list" of actions they committed to perform prior to placing the crane in service. The punch list was adapted specifically for the Model 248 based upon accident investigation team findings and corrective actions in the report of a July 1, 2002, accident involving a model 278 crane (discussed in ORP Inspection Report IR-02-008, Section 1.13.2.7). Some significant differences, for example configuration and controls, between the Model 248 and 278 required the punch list to be adapted for the Model 248.

¹ ORP letter from R. Schepens to R. Naventi, BNI, "Inspection Report A-03-OSR-RPPWTP-001 – On-Location Inspection Report for the Period October 11 Through December 4, 2002," 02-OSR-0620, dated January 13, 2003.

The inspectors determined, upon completion of the punch list actions, the Contractor will have established an appropriate basis for proceeding with the assembly, erection, and inspection of the Model 248 crane in the luffing configuration.

The inspectors observed the Model 248 crane erection activities and interviewed personnel performing the erection. The inspectors evaluated the Load Movement Indicator (LMI) console and the configuration of the controls and switches, paying particular attention to boom stop angles and console readings. The assembly was completed and the crane was rigged up smoothly and safely. Pre-operational checks were planned prior to placing the unit in service. The manufacturer's representative ensured all cab console computer readings were consistent with the physical measurements.

The inspectors informed the Contractor's general foreman all corrective actions from the previous crane problems would be evaluated by the Office of River Protection (ORP) and ORP concurrence was required prior to operating the Model 248 crane in the luffing configuration.

During the inspection period, an accident occurred on-site involving a Model 278 Link-Belt mobile crane when a boom accidentally contacted the counterweights of a nearby tower crane. The inspectors examined the accident location and found the boom had not sustained any significant damage. An aerial inspection demonstrated there was no risk from falling material. The inspectors interviewed the Link-Belt operator and oiler. The operator stated he had lost contact with the spotter, but continued to move the crane without the spotter's assistance, resulting in scraping the top of the boom on the weights. The Contractor placed both cranes back in service after the inspections were completed. The Contractor released procedure 24590-WTP-GPP-CON-1902, *Crane Interference and Boom Swing Coordination*, Revision 0, dated December 2, 2002, and trained crane coordinators and operators on the procedure and re-trained them in signaling requirements. The inspectors had been briefed on the procedure and had determined full implementation would acceptably minimize the type of interference accident, discussed above.

The inspectors interviewed the designated crane coordinator to assess conformance with the Contractor's procedure 24590-WTP-GPP-CON-1902. The inspectors witnessed crane flight plans which were issued during the inspection period. The inspectors found the crane coordinator was diligently checking the cranes within his sector for proper operating quadrants. The inspectors determined the Contractor was properly implementing the procedure requirements.

Potain Tower Crane Update

Problems with the Potain tower cranes have been extensively documented and discussed in Inspection Report A-03-OSR-RPPWTP-001, Section 1.5.2.

The inspectors performed a follow-up inspection of this area to examine the Contractor's plans to resolve electrical wiring and hardware issues associated with the Potain tower cranes regarding wiring and hardware not listed as acceptable by a nationally recognized laboratory. The inspectors were informed the sub-tier subcontractor would provide a rigorous and thorough inspection of the entire system.

Although one tower crane had been energized without a load, no wire rope reeving had taken place. Discussions with the foreman and the superintendent indicated the energization phase (not under load) of the LAW tower crane was completed without incident. Reeving and outfitting the cranes had not been accomplished during this inspection period. The manufacturer's representative was resolving some cab control issues. The inspectors considered this item would remain open pending completion of the nationally recognized laboratory equivalency conformance evaluation and resolution of NEC non-conformance issues. The matrix for conformance, identified in inspection report A-03-OSR-RPPWTP-001, remained open for this inspection period.

The tower crane ladder non-conformance issues, identified in inspection report A-03-OSR-RPPWTP-001, had not been corrected. Although the rungs had been extended further away from the backstops and anchoring points in the tower transition areas, they remained non-conforming for numerous reasons cited in the above inspection report. The Contractor had instituted a fall protection requirement, as a compensatory measure, when moving through the transition area of the towers pending final corrective action by the sub-contractor.

The Contractor planned to bring the tower ladder-ways into conformance with procedures. This issue remains open until the ladders are brought into conformance with Occupational Safety and Health Administration (OSHA) requirements and will be tracked as AFI A-03-OSR-RPPWTP-006-A02.

Propane Tanks

The inspectors examined the 1000-gallon propane tanks located at the LAW, HLW, and PTF construction sites and the 18,000-gallon tank located by the Combo shop. Items examined included fittings, lifting eyes, and gauges. The inspectors reviewed the Contractor's punch list of items needing correction, provided by the Contractor's fire protection engineer, as well as other safe practice standards. The inspectors were informed lifting and movement of any of the tanks would require a lift plan from the Contractor's rigging engineer. The inspectors observed the 1000-gallon tank, located in a depression at the HLW facility, had been moved to the top of the pad; a protected location. The tank was moved under an approved lift plan. The inspectors examined the tank data plates for proper test identification, the required shut-off valves, equipment protection, proper sign location and content, and emergency phone number identification. The inspectors determined the full, in-use, tanks were being prepared to conform with the applicable National Fire Protection Association requirements. However, the inspectors observed no improvements had been performed on the 18,000-gallon or smaller 1000-gallon tanks located near the combo shop; located in a secured area within a fence. The Contractor clearly understood these empty tanks would not be placed in active service until they conformed to the requirements specified by the Contractor's fire protection engineer.

During an inspection of the PTF construction site, the inspectors observed cordoning rope and signage were being dismantled by other construction activities around the 1000-gallon propane tank. The Contractor's safety engineer, who brought this deficiency to the attention of the inspectors, informed the superintendent of the deficiency. The superintendent had the rope and signage restored.

Temporary Enclosures

The inspectors examined temporary enclosures erected for purposes of specialized welding or break areas. In one case, the inspectors observed one wooden enclosure, near the PTF, was not adequately protected against wind damage. The field engineering personnel had established some improvement recommendations and the improvements were completed. The inspectors observed open burning had occurred near the structure. The safety engineer indicated any future burning would only be allowed and conducted under a controlled basis. The remainder of the enclosures were examined and appeared to be well anchored, sturdy, and lined with flame-retardant material. The inspectors examined one enclosure used for welding galvanized metal. The facility was provided with exhaust ventilation. However, the exhaust, depending upon wind direction, blew back into the enclosure. The safety engineer stated an extension would be placed on the exhauster outlet to reduce the amount of infiltration. The inspectors found the welders had been provided with respirators and the Contractor's industrial hygienist had conducted sampling. The sampling results verified the exposures were under the permissible exposure limits. The inspectors determined the actions taken by the Contractor resulted in conformance with their procedures.

1.5.3 Conclusions

The inspectors concluded, with the exception of a few minor instances, the Contractor had acceptably implemented the program for industrial health and safety. With the exception of the crane and Combo shop issues described above, where work is ongoing, identified discrepant conditions were promptly and acceptably corrected and the inspectors determined the Contractor had met the applicable requirements of ORP M 440.1-2.

1.6 Observation of a Construction Emergency Preparedness Drill (ITP I-160)

1.6.1 Inspection Scope

The inspectors observed a construction emergency preparedness drill on December 12, 2002. This drill was based on a simulated injury on-location at the HLW basemat and included bring the Hanford Fire Department ambulance onsite and preparing the injured person for transport to a Richland hospital.

1.6.2 Observations and Assessments

An emergency preparedness program review was conducted during the last inspection period and documented in inspection report A-03-OSR-RPPWTP-001². A detailed review of the following documents were performed at that time:

² Ibid 1.

- 24590-WTP-GPP-SIND-019-01A, *Emergency Management Program*, Revision 1A, March 5, 2002
- 24590-WTP-GPP-SIND-003-01A, *Emergency Action Plan*, Revision 1A, March 5, 2002.

The *Emergency Management Program (Program)* was prepared by the Contractor to meet the Contract requirement to develop an emergency response plan compliant with Hanford Emergency Management Plan, DOE/RL-94-02. The *Emergency Action Plan (Plan)* was an implementing procedure that included as appendices, emergency response organization (ERO) position specific instruction.

At the current stage of construction, the Waste Treatment and Immobilization Plant (WTP) construction facility was designated an administrative facility in terms of emergency response requirements, as defined in DOE/RL-94-02. As a result, site management and staff emergency response activities were limited mostly to protective actions, such as take cover and evacuation, resulting from potential events outside the WTP boundary, and some less significant event responses, such as fires, natural hazards, security events, and industrial accidents. Construction staff was not required to take direct actions to mitigate these types of events, but rather notify the applicable Hanford emergency responders, and standby to support these responders if requested.

The *Emergency Management Program* specified only a few ERO positions for the current state of construction. They include a Project Emergency Director (PED), Accountability Aids, and Staging Area Managers. During this exercise, staff filled the PED position. The Drill was pre-announced and limited to a few workers located near the site of the simulated accident.

The primary function of the drill was to exercise the Contractor's ability to address an accident resulting in an injured employee and to take immediate first aid actions, contact the Hanford Fire Department, escort the ambulance to the accident scene, and prepare the injured person for transport to the hospital.

The Drill began with simulation of an employee falling from a ladder on the HLW basemat. The HLW construction superintendent immediately assumed the roll of the PED, declared a drill emergency exercise, performed an assessment of the employee's injuries, and made a timely notification to the main Security gate, requesting an ambulance. The security staff contacted the Hanford Fire Department and informed the PED the Hanford Fire Department was notified and on the way. The PED also contacted the WTP site health center and requested medical support from on-shift health care providers. Two on-shift health care providers arrived within about 10 minutes and began administering simulated first aid to the injured employee.

The PED assigned an employee to verify a path from the HLW accident location to the main security gate and instructed the employee to wait at the security gate until the ambulance arrived and escort the ambulance to the accident site. The PED also directed staff to clear a path from the accident site to the location where the ambulance was expected to arrive. This effort included laying plywood over exposed rebar to provide a safe path for transporting the injured employee.

Once the ambulance arrived, the assigned escort determined the intended path to the accident location had become blocked due to construction activities at the LAW facility. The escort appropriately redirected the ambulance to the accident site via a different route, resulting in minimal delay. The new arrival location, however, was different than the path cleared by construction staff. The Hanford On-Scene Commander decided the injured employee would be secured in a lift stretcher and lifted by crane to the waiting ambulance. The stretcher was rigged for lifting and the employee was moved on to the stretcher. The drill was appropriately terminated before the lift was made.

The inspectors attended the Contractor's post-drill critique and reviewed the Post-Drill Critique Report; Drill Number 002 dated December 18, 2002. The critique was well-attended and good comments and areas for improvement were noted. The report reflected the comments provided at the critique and assigned appropriate action items to track the completion of needed corrective actions. Comments included the need for on-shift medical providers to review any medical alert badges of injured employees and to ensure their radios are operational, and better repeat-back communications between responders.

The inspectors determined the drill was well coordinated and staff performed adequately in their efforts to respond to the injured employee. Good command and control was demonstrated, and team member adaptability to changing construction conditions was a strength.

1.6.3 Conclusions

The Contractor successfully conducted an emergency preparedness drill at the WTP construction site. ERO staff performed well and the simulated injured worker was provided first aid and made ready for transport to a local hospital in a timely manner. The post-drill critique included good observations and comments and the subsequent report reflected these comments and assigned corrective actions as needed.

1.7 Adequacy of BOP Construction Activities (ORP M 414.1-4)

1.7.1 Inspection Scope

The inspectors reviewed selected balance-of-plant (BOP) construction activities to determine if the Contractor was performing these activities in accordance with the QAM, and approved design, technical specifications, construction procedures, work packages, and other related documents.

1.7.2 Observations and Assessments

Chicago Bridge and Iron Office Trailers

The inspectors examined the Chicago Bridge and Iron Office Trailers located in the Site Tank Fabrication Area for conformance with Electrical Installation Permit No. 24590-WTP-EIP-02-

056, dated December 11, 2002; Drawing 24590-WTP-FSK-CON-T-01-001, Revision 9, dated January 8, 2003, and the sketch for conformance with the 1999 National Electrical Code (NEC), as required in paragraph 2 of 24590-WTP-3PI-E000-00001, *Engineering Bulk Materials*, Revision 2, dated October 18, 2002, the governing specification.

The inspectors examined the installation of ground rods at each mobile office disconnect for conformance with the NEC requirements, identified below.

- NEC-1999, Article 550-23 required *“The mobile home service equipment shall be located adjacent to the mobile home and not mounted in or on the mobile home. The service equipment shall be located in sight from and not more than 9.0 m (30 ft) from the exterior wall of the mobile home it serves. The service equipment shall be permitted to be located elsewhere on the premises, provided that a disconnecting means suitable for service equipment is located in sight from and not more than 9.0 m (30 ft) from the exterior wall of the mobile home it serves. Grounding at the disconnecting means shall be in accordance with Article 250-32.”*

NEC-1999, Article 250-32(b)(1) required *“An equipment grounding conductor as described in 250-118 shall be run with the supply conductors and connected to the building or structure disconnecting means and to the grounding electrode(s). The equipment grounding conductor shall be used for grounding or bonding of equipment, structures, or frames required to be grounded or bonded.”*

The inspectors found the Contractor had not installed ground rods at the Chicago Bridge and Iron Administration and Engineering Mobile Offices, in accordance with the above requirements and, accordingly, the Contractor had not connected the equipment-grounding conductor to the grounding electrode (ground rods) at the disconnect switches located within 30' of mobile offices, as required by the NEC.

The inspectors brought this noncompliance to the Contractor's attention and were informed the Contractor would install the ground rods after an excavation permit is obtained. The Contractor's corrective actions will be examined during a future inspection and tracked as AFI A-03-OSR-RPPWTP-006-A03.

Temporary Power for HLW

The inspectors examined the temporary construction power distribution for the HLW Building as specified by *Temporary Power Request Form*, 24590-WTP-GPP-CON-3311, Revision 0, dated January, 21, 2003, for conformance with the 1999 National Electrical Code, as required in paragraph 2 of 24590-WTP-3PI-E000-00001, *Engineering Bulk Materials*, Revision 2, dated October 18, 2002, the governing specification.

Temporary Power Request Form Number 24590-WTP-EIP-CON-029

The following electrical equipment was examined on the primary distribution rack (PDR)-014, (located northwest corner) - 400 amp non-fused main disconnect, 225 amp 480 volt panelboard, 12 x 12 junction box, two 200 amp disconnects TS-010 & TS-012, and two 30 amp disconnects

(line side only). The following noncompliances with NEC requirements were identified and discussed with the Contractor:

- NEC-1999, Article 250-102(d) required *“The equipment bonding jumper on the load side of the service overcurrent devices shall be sized, as a minimum, in accordance with the sizes listed in Table 250-122, but shall not be required to be larger than the largest ungrounded circuit conductors supplying the equipment and shall not be smaller than 14 AWG.”*

The Contractor had installed a #6 AWG equipment bonding jumper in the 400 amp main disconnect switch instead of the required #3 AWG conductor, required by Table 250-122.

The inspector discussed this noncompliance with the electrical field engineer and the Contractor stated this issue would be corrected during the next outage on the distribution rack. (A-03-OSR-RPPWTP-006-A04a)

- NEC-1999, Article 250-122(a) required *“Copper, aluminum, or copper-clad aluminum equipment grounding conductors of the wire type shall not be smaller than shown in Table 250-122 but shall not be required to be larger than the circuit conductors supplying the equipment.”*

The inspectors observed the Contractor had not sized the equipment grounding conductor correctly in the 400 amp main disconnect and on the line side of the two 200 amp disconnects TS-010 & TS-012, as required by Table 250-122. A #4 AWG equipment grounding conductor was installed from the 400 amp main disconnect to 225 amp panel board (400 amp overcurrent protection - substation #14, breaker #7), instead of the required #3 AWG conductor. The two 200 amp disconnects had a #6 AWG equipment grounding conductor; instead of the required #3 AWG conductor.

The Contractor had previously identified this noncompliance on the *Temporary Power Request Form Number 24590-WTP-EIP-CON-029*. The Contractor had signed it off on December 31, 2002, as corrected. However, the inspectors found the noncompliance had not been corrected.

The inspectors discussed this noncompliance with the electrical field engineer and the Contractor stated the signoff was an error, and this issue would be corrected during the next outage on the distribution rack. (A-03-OSR-RPPWTP-006-A04b)

- NEC-1999, Article 110-3(b) required *“Listed or labeled equipment shall be installed and used in accordance with any instructions included in the listing or labeling.”*

The inspectors observed the Contractor had installed a panelboard labeled 480/277 volt three phase four-wire in an application that required a 480 volt three phase three-wire panelboard. Accordingly, the inspectors concluded the panelboard had not been installed in manner identified by the panelboard nameplate.

The inspectors concluded the installation did not conform to the requirement of the NEC Article 110-3(b), discussed above, in accordance with the listing or labeling requirements of the component.

The Contractor disagreed with the inspectors' conclusion regarding the panelboard not being installed in accordance with the listing or labeling requirements of the component. The Contractor's basis for this disagreement was the panelboard was fed from Substation 14, which is a 3-phase, 4-wire, 480Y/277Vac system, and these types of panelboards (GE type AE) were suitable for use on three phase, three-wire 480V ac applications when derived from the source described above.

The inspectors will verify the Contractor's technical basis during a future inspection.
(A-03-OSR-RPPWTP-006-A04c)

- NEC-1999, Article 110-22 required *"Each disconnecting means shall be legibly marked to indicate its purpose unless located and arranged so the purpose is evident. The marking shall be of sufficient durability to withstand the environment involved."*

The Contractor labeled disconnects TS-010 & TS-012 with pencil, a non-permanent maker.

The inspector discussed this issue with the electrical field engineer and the Contractor subsequently re-marked the disconnects to meet the requirement. This issue is closed.

- NEC-1999, Article 310-12(c) required *"Conductors that are intended for use as ungrounded conductors, whether used as a single conductor or in multiconductor cables, shall be finished to be clearly distinguishable from grounded and grounding conductors."*

The inspectors observed the Contractor had not clearly distinguished the white wires (used as ungrounded conductors) in the 12 x 12 junction box.

The inspector discussed this noncompliance with the electrical field engineer and the Contractor agreed to identify these conductors with the appropriate phase tape.
(A-03-OSR-RPPWTP-006-A04d)

Temporary Power Request Number 24590-WTP-EIP-CON-02-074 and 24590-WTP-EIP-CON-02-058

The inspectors examined the electrical equipment installation on power distribution racks TS-010 (located west center) and TS-012 (located southwest corner), both consisting of a 200 amp main disconnect, two 100 amp disconnects (line side only), two 30 amp welding receptacle disconnects (fused 20 amps), 100 amp MPC disconnect (fused 70 amp), and 25 KVA mini power centers MPC-010 and MPC-012. The following electrical code noncompliances were identified by the inspectors and discussed with the Contractor:

- NEC-1999, Article 250-97 required *“For circuits of over 250 volts to ground, where oversized, concentric, or eccentric knockouts are not encountered, the electrical continuity of metal raceways and cables with metal sheaths that contain any conductor other than service conductors shall be ensured by one or more of the methods specified for services in 250-94(1) through (4).”*

The inspectors observed the Contractor had not installed grounding bushings on the liquid-tight flexible metal conduit (480 volt) installed in concentric knockouts, at the two 30 amp welding receptacle disconnects, at both TS-010 & TS-012 locations.

The inspectors discussed this noncompliance with the electrical field engineer and the Contractor stated the ground bushings will be installed on raceways with concentric knockouts. The Contractor’s corrective actions will be examined during a future inspection. (A-03-OSR-RPPWTP-006-A04e)

Resolution of the above noncompliances will be examined during a future inspection. The five subparts (a-e), above, will be tracked to closure under AFI A-03-OSR-RPPWTP-006-A04.

Temporary Power for LAW

The inspectors examined the temporary construction power distribution for the south LAW area for conformance with Temporary Power Request Form, 24590-WTP-GPP-CON-3311, Revision 0, dated January 21, 2003, and Temporary Power Request Number 24590-WTP-EIP-CON-031 for conformance to the 1999 National Electrical Code specified in paragraph 2 of 24590-WTP-3PI-E000-00001, *Engineering Bulk Materials*, Revision 2, dated October 18, 2002, the governing specification.

The inspectors examined items such as conductors, terminations, and grounding requirements for the PDR, and the electrical equipment installed in the LAW lunchroom located in the southwest corner. The following electrical code noncompliances were identified and discussed with the Contractor:

- NEC-1999, Article 250-32(b)(1) requires *“An equipment grounding conductor as described in 250-118 shall be run with the supply conductors and connected to the building or structure disconnecting means and to the grounding electrode(s). The equipment grounding conductor shall be used for grounding or bonding of equipment, structures, or frames required to be grounded or bonded.”*

The inspectors observed the Contractor had not connected the equipment-grounding conductor to the grounding electrode at the 400 amp South #1 Disconnect Switch, as required.

The inspectors discussed this noncompliance with the electrical field engineer and the Contractor stated this item would be corrected during the next outage on this equipment. (A-03-OSR-RPPWTP-006-A05a)

- NEC-1999, Article 250-122(a) required *“Copper, aluminum, or copper-clad aluminum equipment grounding conductors of the wire type shall not be smaller than shown in Table 250-122 but shall not be required to be larger than the circuit conductors supplying the equipment.”*

The inspectors observed the Contractor had not sized the equipment grounding conductor correctly in various disconnects located on the PDR, as required per Table 250-122.

The inspector discussed this noncompliance with Contractor electrical field engineer and the equipment grounding conductors were replaced. This resolved this issue.

- NEC-1999, Article 250-148(a) stated, *“A connection shall be made between the one or more equipment grounding conductors and a metal box by means of a grounding screw that shall be used for no other purpose or a listed grounding device.”*

The inspectors observed the Contractor had not installed the bonding strap in the heater disconnect located in the temporary lunchroom; therefore, the equipment grounding conductors were isolated from the metal enclosure.

The inspectors discussed this noncompliance with Contractor electrical field engineer and the bonding strap was installed. This resolved this issue.

- NEC-1999, Article 110-12(a) required *“Unused openings in boxes, raceways, auxiliary gutters, cabinets, cutout boxes, equipment cases, or housings shall be effectively closed to afford protection substantially equivalent to the wall of the equipment.”*

The inspectors observed the Contractor had not installed a switch for lights in a temporary lunchroom; therefore, there was an un-used opening in the cover.

This item had been previously identified by the Contractor and documented on an inspection report for correction. This resolved the issue.

- NEC-1999, Article 370-28 required *“Boxes and conduit bodies used as pull or junction boxes shall comply with (a) through (d).”*

(a) Minimum Size. For raceways containing conductors of 4 AWG or larger, and for cables containing conductors of 4 AWG or larger, the minimum dimensions of pull or junction boxes installed in a raceway or cable run shall comply with the following:

(2) Angle or U Pulls. Where splices or where angle or U pulls are made, the distance between each raceway entry inside the box and the opposite wall of the box shall not be less than six times the metric designator (trade size) of the largest raceway in a row. This distance shall be increased for additional entries by the amount of the sum of the diameters of all other raceway entries in the same row on the same wall of the box. Each row shall be calculated individually, and the single row that provides the maximum distance shall be used.”

The inspectors observed the Contractor had not sized the conduit body (LB) properly to meet these requirements at the 400 amp main switch.

The inspectors discussed this noncompliance with the electrical field engineer and the Contractor stated this conduit body would be replaced with a cable grip when the material (which was on order) was received and the equipment could be shut down to perform the change. (A-03-OSR-RPPWTP-006-A05b)

The above subpart items (a-b) will be tracked to closure under AFI A-03-OSR-RPPWTP-006-A05.

High Mast Lighting

The inspectors observed a flexible cord (type SEOOW) installed for the High Mast Lighting at the north end of T1 Building was direct buried in soil.

The inspectors notified the Contractor electrical field engineer of the issue and the inspectors' conclusion that the installation failed to conform to the National Electrical Code, Article 400-6. This Article required flexible cord to be evaluated for direct burial and the cable marked as such. The Contractor's engineer stated the proper personnel would be notified and the noncompliance corrected.

The corrective action had not been completed by the end of this inspection period. The inspectors will examine the Contractor's corrective actions during a future inspection. Follow-up will be tracked as AFI A-03-OSR-RPPWTP-006-A06.

Site Electrical Distribution Duct Bank

The inspectors examined the 13.8 KV temporary manhole MH-P4, located north of the T1 Building, and temporary substation #2, located west side of Warehouse Building 52, to assess installation conformance with Field Sketch 24590-WTP-FSK-CON-T-01-036, *13.8 KV Temporary Power Duct Bank Layout*, Revision 0, dated February 27, 2002, and the 1999 National Electrical Code. The temporary manhole was installed at final grade, which was approximately two feet below rough grade; because of this the manhole had flooded in the past. The Contractor pumped out the manhole and has since installed a berm around it. Substation #2 had a continuous stream of water draining from one of the conduits installed in the manhole.

The inspectors identified the following noncompliances:

- NEC-1999, Article 250-2(c) required electrically conductive materials that are likely to become energized shall be bonded together and to the electrical supply source in a manner that establishes an effective path for fault current.

The Contractor did not bond the metal covers and unistrut supports in manhole MH-P4 and substation #2, as required.

The inspectors discussed this noncompliance with the electrical field engineer and the Contractor stated this issue would be corrected within the week. The Contractor's corrective actions will be examined during a future inspection.
(A-03-OSR-RPPWTP-006-A07a)

- NEC-1999, Article 370-72(e), required covers for boxes be permanently marked "DANGER — HIGH VOLTAGE — KEEP OUT." The marking shall be on the outside of the box cover and shall be readily visible. Letters shall be block type and at least 13 mm (1/2 in.) in height.

The Contractor had not label the covers in manhole MH-P4, as required.

The inspectors brought this noncompliance to the Contractor's attention and were informed the Contractor would label the manhole covers. The Contractor's corrective actions will be examined during a future inspection. (A-03-OSR-RPPWTP-006-A07b)

- NEC-1999, Article 300-6(b), required supports and support hardware shall be permitted to be installed in concrete or in direct contact with the earth, or in areas subject to severe corrosive influences where made of material judged suitable for the condition, or where provided with corrosion protection approved for the condition.

The Contractor supported the conductors within substation #2 manhole with rope.

The inspectors discussed this noncompliance with the electrical field engineer and the Contractor stated this issue would be corrected within the week. The Contractor's corrective actions will be examined during a future inspection.
(A-03-OSR-RPPWTP-006-A07c)

The inspectors examined the 13.8 KV permanent manholes MH-21 and MH-24 located in accordance with drawing 24590-BOF-E2-E54T-00001, *Site Electrical Distribution Duct Bank Plan*, Revision 2, dated August 8, 2002, for conformance to drawings 24590-BOF-C0 50-00011, *Non-ITS Electrical Manhole Sections And Details*, Revision 2, dated September 20, 2001, and the 1999 edition of the National Electrical Code.

The inspectors identified the following drawing/code deficiencies:

- Drawing 24590-BOF-C0 50-00011 required 12" drain holes in bottom of manholes.

The Contractor did not install the drains in manholes MH-21 & MH-24, as required by drawing.

The inspectors discussed this noncompliance with the electrical field engineer and the Contractor stated the drains would be installed. The inspectors indicated the best industrial practice was to have a gravel backfill bedding installed for the drain. The Contractor agreed and stated the field engineers had discussed this issue. The Contractor's corrective actions will be examined during a future inspection.
(A-03-OSR-RPPWTP-006-A07d)

- NEC-1999, Article 250-2(c) required electrically conductive materials that are likely to become energized shall be bonded together and to the electrical supply source in a manner that establishes an effective path for fault current.

The Contractor did not bond the metal covers and unistrut supports in manholes MH-21 & MH-24, as required above.

The inspectors discussed this noncompliance with the electrical field engineer and the Contractor stated this issue would be corrected within the week. The Contractor's corrective actions will be examined during a future inspection.

(A-03-OSR-RPPWTP-006-A07e)

- NEC-1999, Article 370-72(e), required covers for boxes be permanently marked "DANGER — HIGH VOLTAGE — KEEP OUT." The marking shall be on the outside of the box cover and shall be readily visible. Letters shall be block type and at least 13 mm (1/2 in.) in height.

The Contractor had not labeled the covers for manhole MH-21 & MH-24, as required.

The inspector brought this noncompliance to the Contractor's attention and was informed the Contractor would label the manhole covers. The Contractor's corrective actions will be examined during a future inspection. (A-03-OSR-RPPWTP-006-A07f)

Follow-up on resolution of the above open subpart items (a-f) will be tracked to closure under AFI A-03-OSR-RPPWTP-006-A07.

Concrete Placement for Switchgear Building Foundation

The inspectors witnessed the concrete placement for the switchgear building 87 foundation slab, Concrete Pour Card 24590-BOF-DBR-CON-02-C184. The inspectors concluded the concrete was produced, placed, consolidated, and tested in accordance with procedures, specifications, and the required industry codes and standards. The inspector verified the concrete did not exceed the maximum allowed free fall distance, as required by Section 3.7.1 of the *Engineering Specification for Concrete Work*.

1.7.3 Conclusions

During this inspection period ORP inspectors identify a large number of BOP electrical NEC noncompliances. These issue combined with the issues identified during the previous inspection period represent a significant concern regarding the quality and safety of site electrical work.

1.8 Closure of Inspection Items (Inspection Administrative Procedures (IAP) A-105 and A-106)

The following Findings and Follow-up Item were reviewed to determine if they could be closed. The inspectors reviewed the Contractor's description of the Findings, the corrective actions, and other information provided. The inspectors verified by records review the corrective actions stated were appropriately completed.

1.8.1 (Closed IR-02-008-01b-FIN) Failure to revise the engineering drawing when approving a Supplier Deviation Disposition Request (SDDR) to allow a change in C5 duct material. The Contractor provided their response to the Finding on October 17, 2002, by letter CCN 043649 and documented the discrepancy by NCR 24590-WTP-NCR-CON-02-095 on July 15, 2002.

In their response, the Contractor agreed with the Finding and pointed out the cause was the design drawings had not been revised to reflect the change in material approved by the Supplier Deviation Disposition Request (SDDR) 24590-WTP-SDDR-PROC-02-0007 on April 24, 2002.

As immediate corrective action, the Contractor revised the applicable design drawings to reflect the material change from A-312 to A-240. The inspectors examined the three drawings for the C5 duct and verified the drawing notes had been revised to reflect the proper material.

The Contractor dispositioned the NCR 'use-as-is' with the requirement to revise the applicable design drawings to reflect the material change. The inspectors examined the technical justification for the disposition and concluded the Contractor had exercised sound technical judgment and timely corrective actions in their disposition. The inspectors discussed the completion of corrective actions with responsible field engineering personnel and determined the corrective actions had been completed as stated.

Based upon the above, this Finding is closed.

1.8.2 (Closed IR-02-008-01c-FIN) Failure of sectional welding shop spool drawings C4658-007-2, and -3 to specify the appropriate material used to fabricate the C5 duct. The Contractor provided their response to the Finding in a letter dated October 17, 2002 (CCN 043649).

In their response, the Contractor agreed with the Finding and pointed out the sectional welding shop spool drawings in question referenced isometric spool drawing (C4658-M-007-1) which contained the plan and elevation views for the melter cave embedded C5 duct and contained a note identifying the correct material to be used for duct fabrication. The Contractor also pointed out since the isometric drawing provided the material requirement, the sectional welding shop spool drawings reflected welding characteristics, only, and did not need to identify the material specification. The inspectors agreed with the Contractor's conclusions.

Based upon the above, this Finding is closed.

1.8.3 (Closed Assessment Follow-up Item A-03-OSR-RPPWTP-001-A01) The 30-amp High Mast Lighting breaker box was not listed/label. The Engineering Specification for Electrical Bulk Materials, Paragraph 3.1 required "All electrical components, devices, and

accessories included in this specification shall be UL listed and labeled as defined in NFPA 70, Article 100." There was no listing/label on the 30-amp breaker box at High Mast Lighting Pole number HM-7.

The Contractor verified the breaker box is a general-use NEMA type 1 enclosure and, therefore, the type number is not required to be marked on the enclosure, reference Article 430-91.

Base upon the above, this open item is closed.

2.0 EXIT MEETING SUMMARY

The inspectors presented preliminary inspection results to members of Contractor management at an exit meeting on January 24, 2003. The Contractor acknowledged the observations and conclusions. During discussions regarding ORP concerns with the number of NEC violations, the Contractor stated they would address this concern and were in the final stages of hiring an experienced NEC inspector to supplement BNI field engineering inspection efforts. The inspectors asked the Contractor whether any materials examined during the inspection should be considered limited rights data. The Contractor stated no limited rights data were examined during the inspection.

3.0 REPORT BACKGROUND INFORMATION

3.1 Partial List of Persons Contacted

J. Auyer, Safety Assurance Emergency Preparedness Manager
J. Betts, Deputy Project Manager
J. Dougherty, Site Manager
M. Ensminger, Quality Control Supervisor
G. McClain, General Superintendent
S. Goldsmith, Field Engineer
P. Guettner, Safety Assurance
T. Horst, Construction Manager
B. Kerrigan, QA Supervisor
R. Naventi, Project Director
D. Neal, QA Engineer
B. Niemi, Safety Programs Engineer
G. Shell, Quality Assurance Manager
S. Vail, Mechanical Systems Engineer

3.2 List of Inspection Procedures Used

Inspection Technical Procedure I-112, "Geotechnical/Foundation Inspection"

Inspection Technical Procedure I-113, "Structural Concrete Inspection"

Inspection Technical Procedure I-123, "Corrosion/Erosion Evaluation Assessment"

Inspection Technical Procedure I-138, "Inspection of Fire Protection System Inspection, Testing, and Maintenance"

Inspection Technical Procedure I-160, "Industrial Health and Safety Program Inspection"

Inspection Technical Procedure I-161, "Industrial Health and Safety Inspection"

ORP Instruction ORP M 414.1-4, "WTP Balance-of-Plant Construction Oversight Program."

3.3 List of Items Opened, Closed, and Discussed

Opened

A-03-OSR-RPPWTP-006-A01	Assessment Follow-up Item	Follow-up on Contractor efforts to perform an IH&S evaluation of the Combo Shop. (Section 1.5.2)
A-03-OSR-RPPWTP-006-A02	Assessment Follow-up Item	Follow-up on Contractor efforts to resolve OSHA concerns associated with the Potain Tower crane. (Section 1.5.2)
A-03-OSR-RPPWTP-006-A03	Assessment Follow-up Item	Follow-up on Contractor efforts to resolve NEC noncompliances associated with the Chicago Bridge and Iron Office Trailers. (Section 1.7.2)
A-03-OSR-RPPWTP-006-A04	Assessment Follow-up Item	Follow-up on Contractor efforts to resolve NEC noncompliances associated with HLW Temporary Power. (Section 1.7.2)
A-03-OSR-RPPWTP-006-A05	Assessment Follow-up Item	Follow-up on Contractor efforts to resolve NEC noncompliances associated with LAW Temporary Power. (Section 1.7.2)
A-03-OSR-RPPWTP-006-A06	Assessment Follow-up Item	Follow-up on Contractor efforts to resolve a NEC noncompliance associated with High Mast Lighting. (Section 1.7.2)
A-03-OSR-RPPWTP-006-A07	Assessment Follow-up Item	Follow-up on Contractor efforts to resolve NEC noncompliances associated with the Site Electrical Distribution Duct Bank. (Section 1.7.2)

Closed

IR-02-008-01b-FIN	Finding	Failure to revise the engineering drawing when approving a Supplier Deviation Disposition Request (SDDR) to allow a change in C5 duct material. (Section 1.8.1)
IR-02-008-01c-FIN	Finding	Failure of sectional welding shop spool drawings C4658-007-2, and -3 to specify the appropriate material used to fabricate the C5 duct. (Section 1.8.2)
A-03-OSR-RPPWTP-001-A01	Assessment Follow-up Item	The 30-amp High Mast Lighting breaker Follow-up box was not listed/label. (Section 1.8.3)

Discussed

None.

3.4 List of Acronyms

AB	authorization basis
ACI	American Concrete Institute
ASTM	American Society for Testing and Material
AWG	American Wire Gage
BNI	Bechtel National, Inc.
BOP	Balance of Plant
DOE	U.S. Department of Energy
ERO	Emergency Response Organization
FE	field engineer
FMR	Field Material Requisition
HLW	High Level Waste
HVAC	Heating, Ventilation, and Air Conditioning
IH&S	Industrial Health and Safety
IR	Inspection Report
ITP	Inspection Technical Procedure
ITS	important-to-safety
JHA	Job Hazards Analyses
LAW	Low Activity Waste
LMI	Load Movement Indicator
NCR	Nonconformance Report
NEC	National Electric Code
NFPA	National Fire Protection Association
ORP	Office of River Protection
OSHA	Occupational Safety and Health Administration
OSR	Office of Safety Regulation

PED	Project Emergency Director
PDC	Project Document Control
PDR	Primary Distribution Rack
PTF	Pretreatment Facility
QA	Quality Assurance
QAM	Quality Assurance Manual
QC	quality control
SC	Safety Criteria
SRD	Safety Requirements Document
SDDR	Supplier Deviation Disposition Request
WTP	Waste Treatment and Immobilization Plant